

## 299-W15-60 (A7361) Log Data Report

### Borehole Information:

<b>Borehole:</b> 299-W15-60 (A7361)		<b>Site:</b> 216-Z-10 Injection/Reverse Well			
<b>Coordinates (WA State Plane)</b>		<b>GWL (ft)<sup>1</sup>:</b> None	<b>GWL Date:</b> 05/17/05		
<b>North</b> 135892.684	<b>East</b> 566566.206	<b>Drill Date</b> 09/47	<b>TOC<sup>2</sup> Elevation</b> 679.08 ft	<b>Total Depth (ft)</b> 175	<b>Type</b> Cable

### Casing Information:

<b>Casing Type</b>	<b>Stickup (ft)</b>	<b>Outer Diameter (in.)</b>	<b>Inside Diameter (in.)</b>	<b>Thickness (in.)</b>	<b>Top (ft)</b>	<b>Bottom (ft)</b>
Welded steel	2.0	8 5/8	8	5/16	2.0	175

### Borehole Notes:

The logging engineer used a steel tape and caliper to determine the casing diameter and stickup. All measurements were rounded to the nearest 1/16-in.

### Logging Equipment Information:

<b>Logging System:</b> Gamma 1E	<b>Type:</b> SGLS (70%) 34TP40587A
<b>Effective Calibration Date:</b> 03/04/05	<b>Calibration Reference:</b> DOE-EM/GJ864-2005
<b>Logging Procedure:</b> MAC-HGLP 1.6.5, Rev. 0	

<b>Logging System:</b> Gamma 4I	<b>Type:</b> Passive Neutron U1754
<b>Calibration Date:</b> None	<b>Calibration Reference:</b> None
<b>Logging Procedure:</b> MAC-HGLP 1.6.5, Rev. 0	

### Spectral Gamma Logging System (SGLS) Log Run Information:

<b>Log Run</b>	<b>1</b>	<b>2 Repeat</b>	<b>3</b>		
Date	05/18/05	05/19/05	05/19/05		
Logging Engineer	Spatz	Spatz	Spatz		
Start Depth (ft)	172.5	43.5	24.5		
Finish Depth (ft)	25.5	25.5	2.5		
Count Time (sec)	100	100	100		
Live/Real	R	R	R		
Shield (Y/N)	N	N	N		
MSA Interval (ft)	1.0	1.0	1.0		
ft/min	N/A <sup>3</sup>	N/A	N/A		

Log Run	1	2 Repeat	3		
Pre-Verification	AE062CAB	AE064CAB	AE064CAB		
Start File	AE063000	AE064000	AE064019		
Finish File	AE063147	AE064018	AE064041		
Post-Verification	AE063CAA	AE064CAA	AE064CAA		
Depth Return Error (in.)	0	N/A	0		
Comments	No fine-gain adjustment.	No fine-gain adjustment.	No fine-gain adjustment.		

### **Passive Neutron Logging System (PNLS) Log Run Information:**

Log Run	4	5 Repeat			
Date	06/09/05	06/09/05			
Logging Engineer	Spatz	Spatz			
Start Depth (ft)	172.5	50.5			
Finish Depth (ft)	1.5	31.5			
Count Time (sec)	N/A	N/A			
Live/Real	N/A	N/A			
Shield (Y/N)	N	N			
Sample Interval (ft)	1.0	1.0			
ft/min	1.0	1.0			
Pre-Verification	DI202CAB	DI202CAB			
Start File	DI202000	DI202172			
Finish File	DI202171	DI202191			
Post-Verification	DI202CAA	DI202CAA			
Depth Return Error (in.)	- 2	0			
Comments	None	None			

### **Logging Operation Notes:**

Pre- and post-survey verification measurements for the SGLS were acquired using the Amersham KUT ( $^{40}\text{K}$ ,  $^{238}\text{U}$ , and  $^{232}\text{Th}$ ) verifier with serial number 118. A centralizer was installed on the sondes.

Passive neutron logging was also performed in the borehole. This logging method has been shown to be effective in qualitatively detecting zones of alpha-emitting contaminants from secondary neutron flux generated by the ( $\alpha$ ,n) reaction and may indicate the presence of transuranic radionuclides.

### **Analysis Notes:**

<b>Analyst:</b>	Henwood	<b>Date:</b>	06/21/05	<b>Reference:</b>	GJO-HGLP 1.6.3, Rev. 0
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SGLS pre-run and post-run verification spectra were collected at the beginning and end of each day of logging. All of the SGLS verification spectra were within the acceptance criteria. Examinations of data indicate that the detectors functioned normally during logging, and the data are accepted.

An AmBe neutron source was used for verification measurements with the passive neutron logging system. Currently there are no verification criteria established for this system. The counts obtained from the pre and post verifications were within 1 percent.

Log spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Verification spectra were used to determine the energy and resolution

calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source file: G1EMar05.xls). The casing configuration was assumed as one string of 8 5/8-in. outer diameter (OD) casing with a thickness of 5/16 in. to total depth (175 ft). No dead time or water corrections were applied to the data.

### **Log Plot Notes:**

Separate log plots are provided for man-made radionuclides, naturally occurring radionuclides ( $^{40}\text{K}$ ,  $^{238}\text{U}$ , and  $^{232}\text{Th}$ ), total gamma and dead time, and total gamma and passive neutron. Plots of the repeat logs versus the original logs are included. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The  $^{214}\text{Bi}$  peak at 1764 keV is used to determine the naturally occurring  $^{238}\text{U}$  concentrations on the combination plot rather than the  $^{214}\text{Bi}$  peak at 609 keV because it exhibited slightly higher net counts per second.

### **Results and Interpretations:**

$^{137}\text{Cs}$  was the man-made radionuclide detected in this borehole.  $^{137}\text{Cs}$  was detected at a few locations near its MDL of approximately 0.2 pCi/g.

The passive neutron detector indicated no significant neutron flux. Slight elevation in count rate (0.6 cps) was observed near the ground surface but is not believed to be related to alpha-emitting contaminants.

The  $^{40}\text{K}$  and  $^{232}\text{Th}$  logs showed a general increase in concentrations at approximately 40 ft, suggesting a lithology change. Apparent  $^{232}\text{Th}$  concentrations were elevated by approximately 0.6 pCi/g in the interval between 117 and 125 ft, and this increase corresponds with fine-grained sediment of the Cold Creek Interval (formerly known as the Early Palouse Soil). The relatively low  $^{40}\text{K}$  and  $^{232}\text{Th}$  values in the interval between 124 and 137 ft as well as the relatively high  $^{238}\text{U}$  values are characteristic of the carbonate paleosols of the Cold Creek Interval.

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS data for the natural and man-made radionuclides and the passive neutron.

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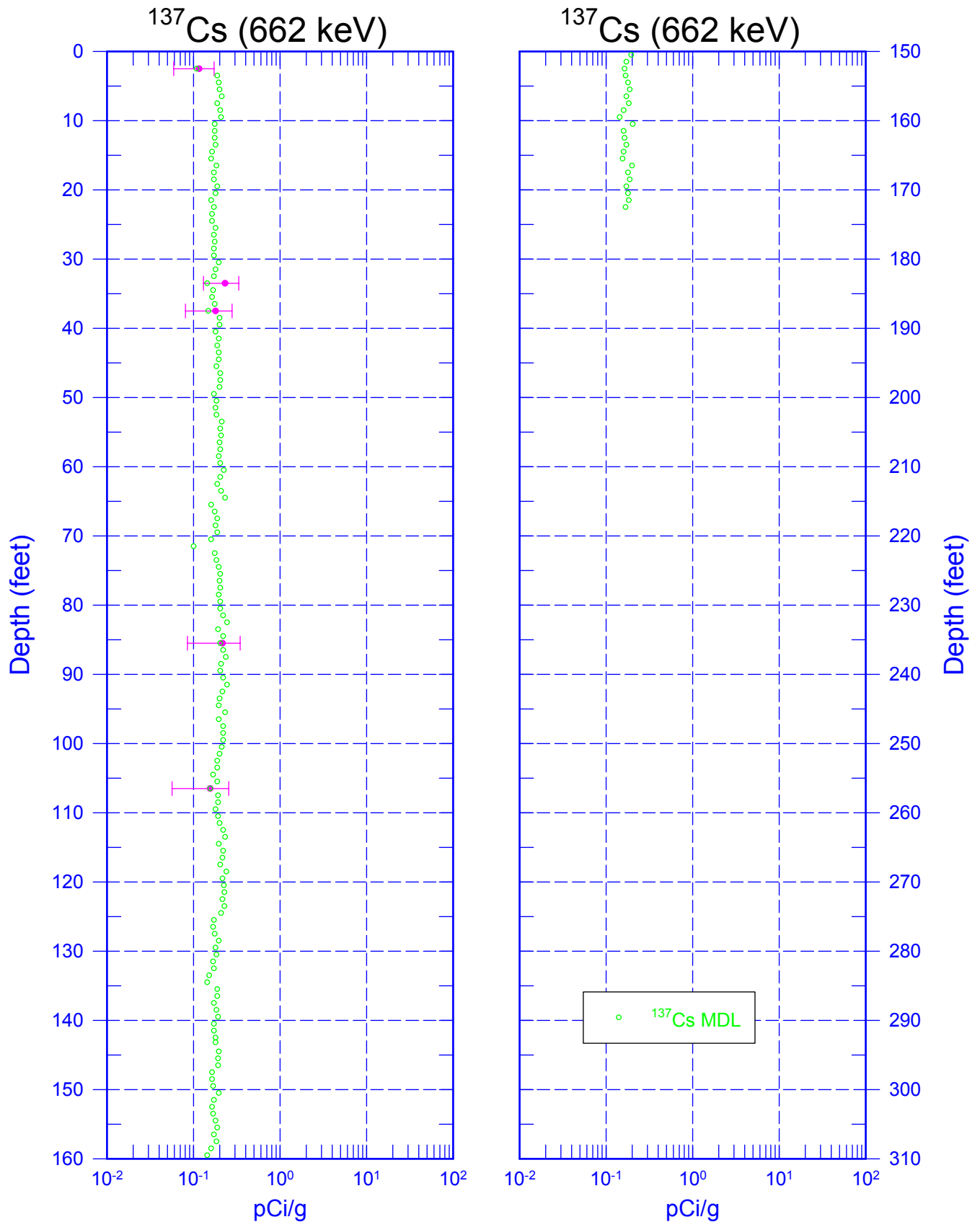
<sup>1</sup> GWL – groundwater level

<sup>2</sup> TOC – top of casing

<sup>3</sup> N/A – not applicable

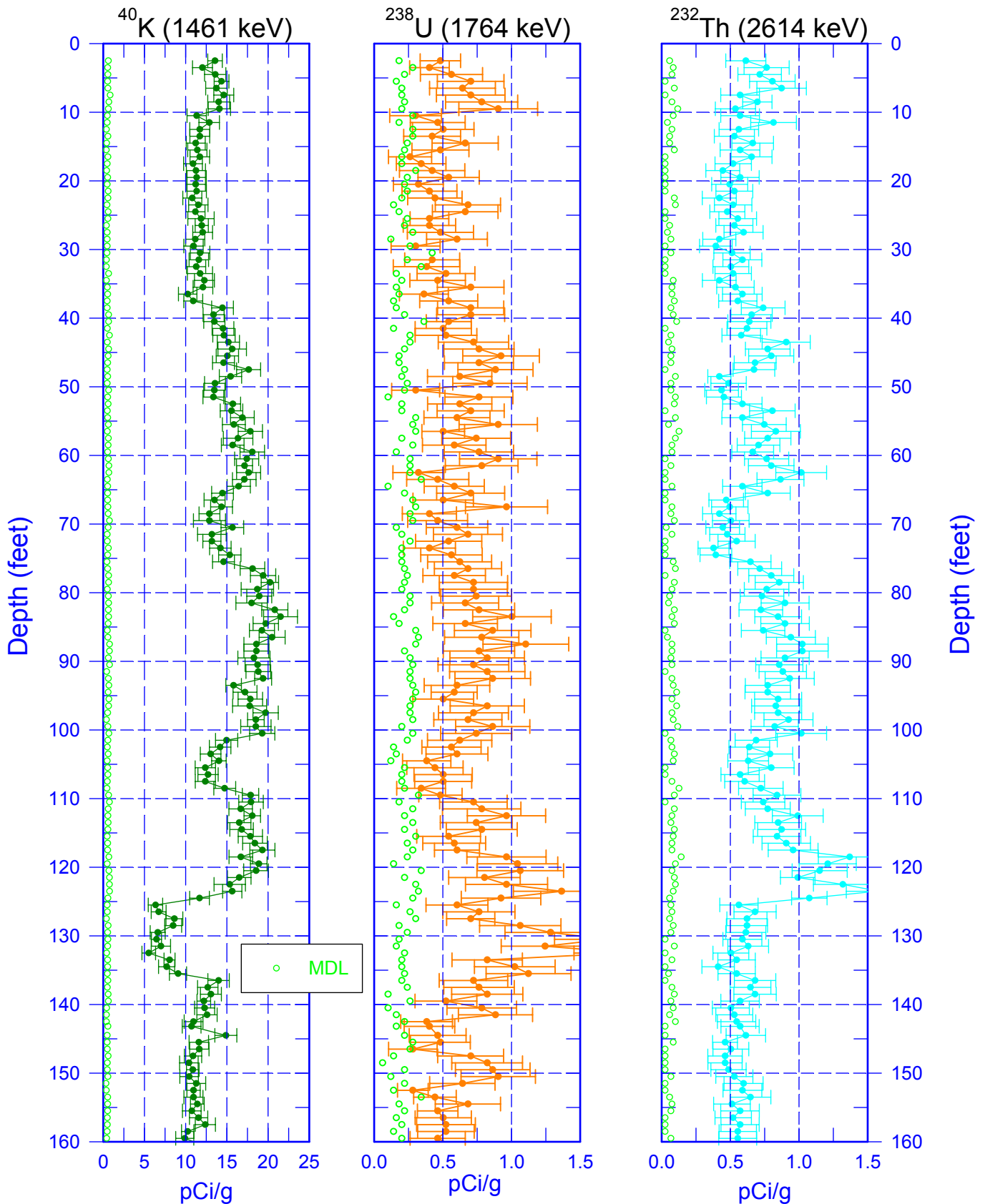
# 299-W15-60 (A7361)

## Man-Made Radionuclides



# 299-W15-60 (A7361)

## Natural Gamma Logs

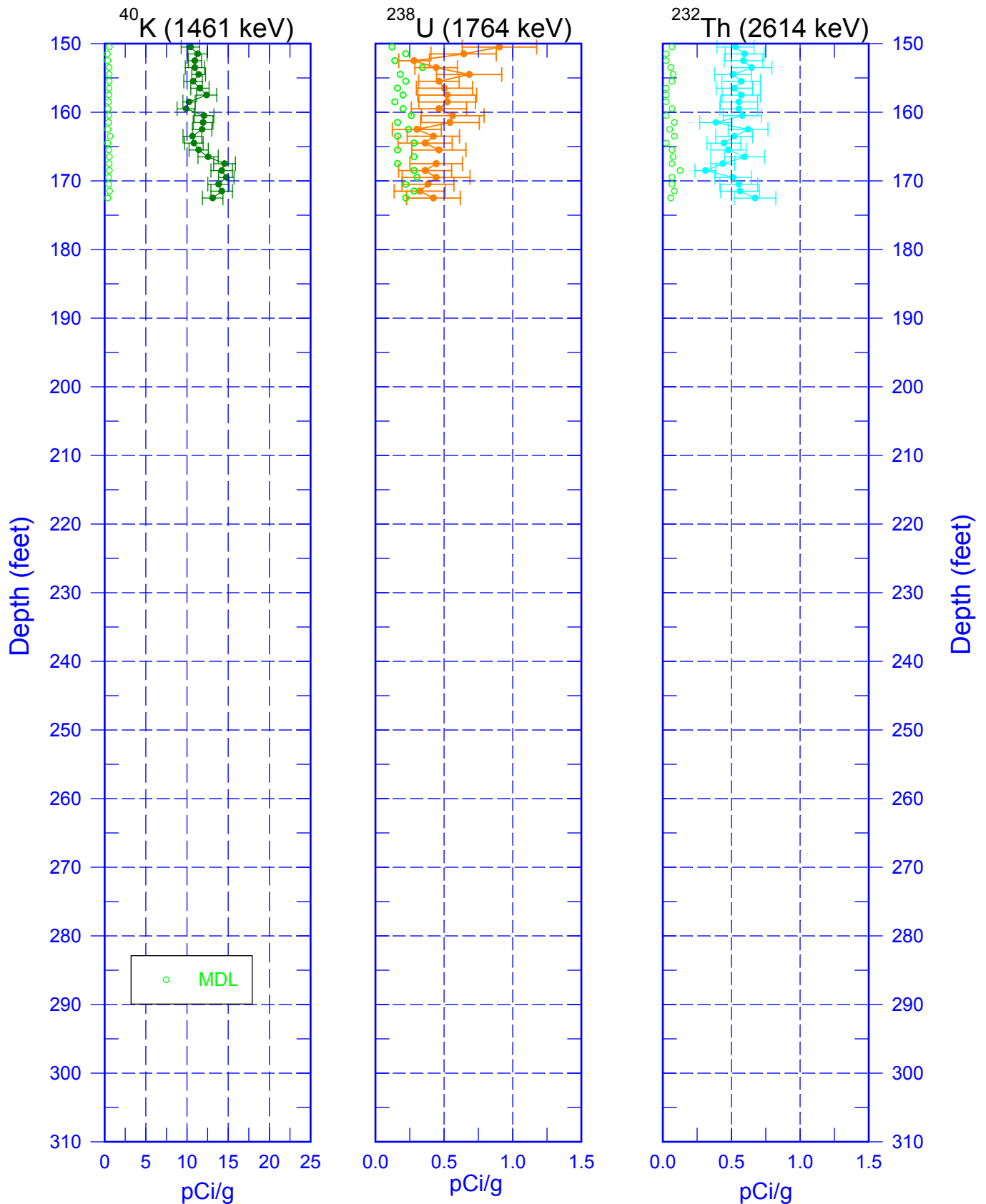


Zero Reference = Top of Casing

Last Log Date - 06/09/05

# 299-W15-60 (A7361)

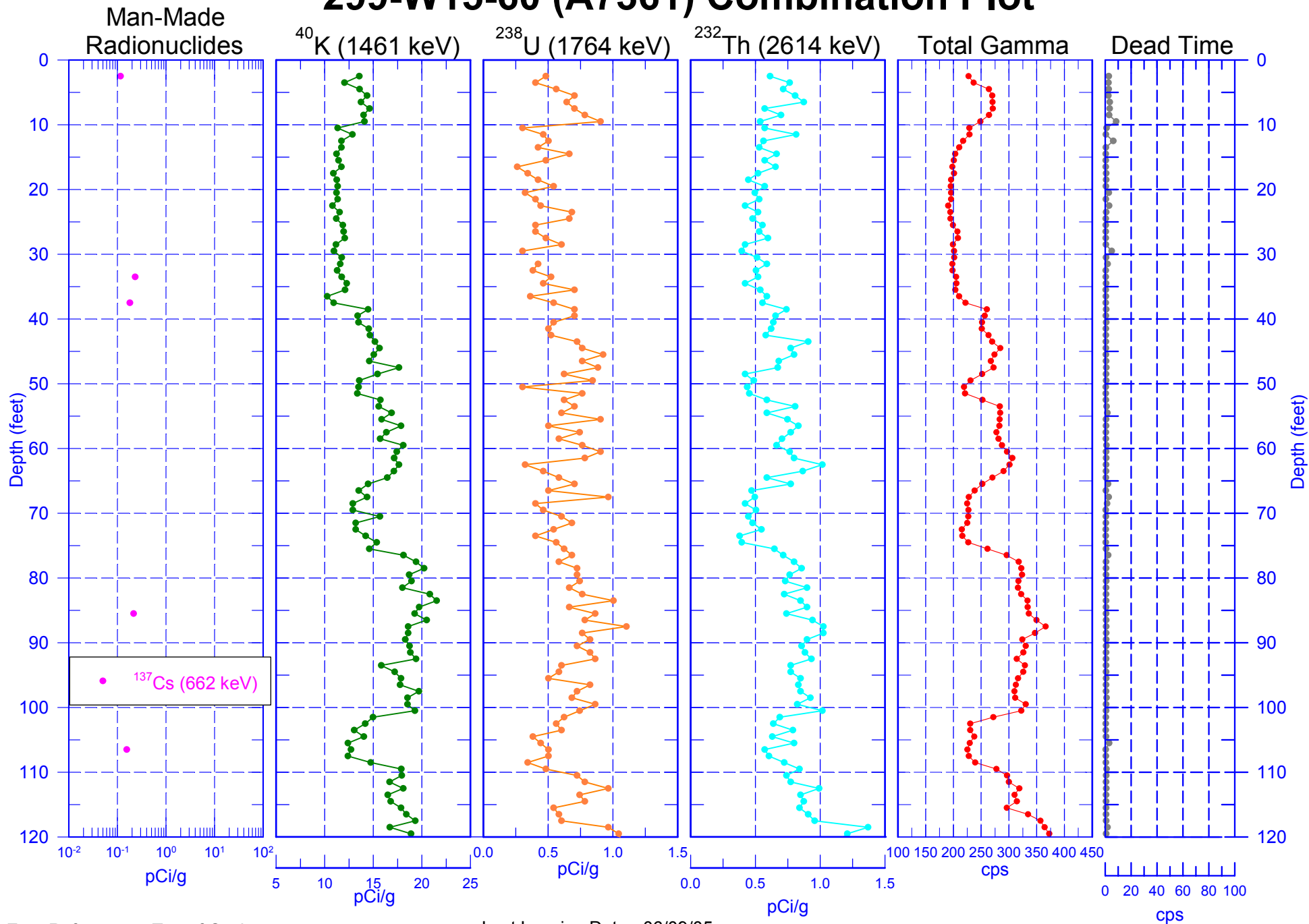
## Natural Gamma Logs



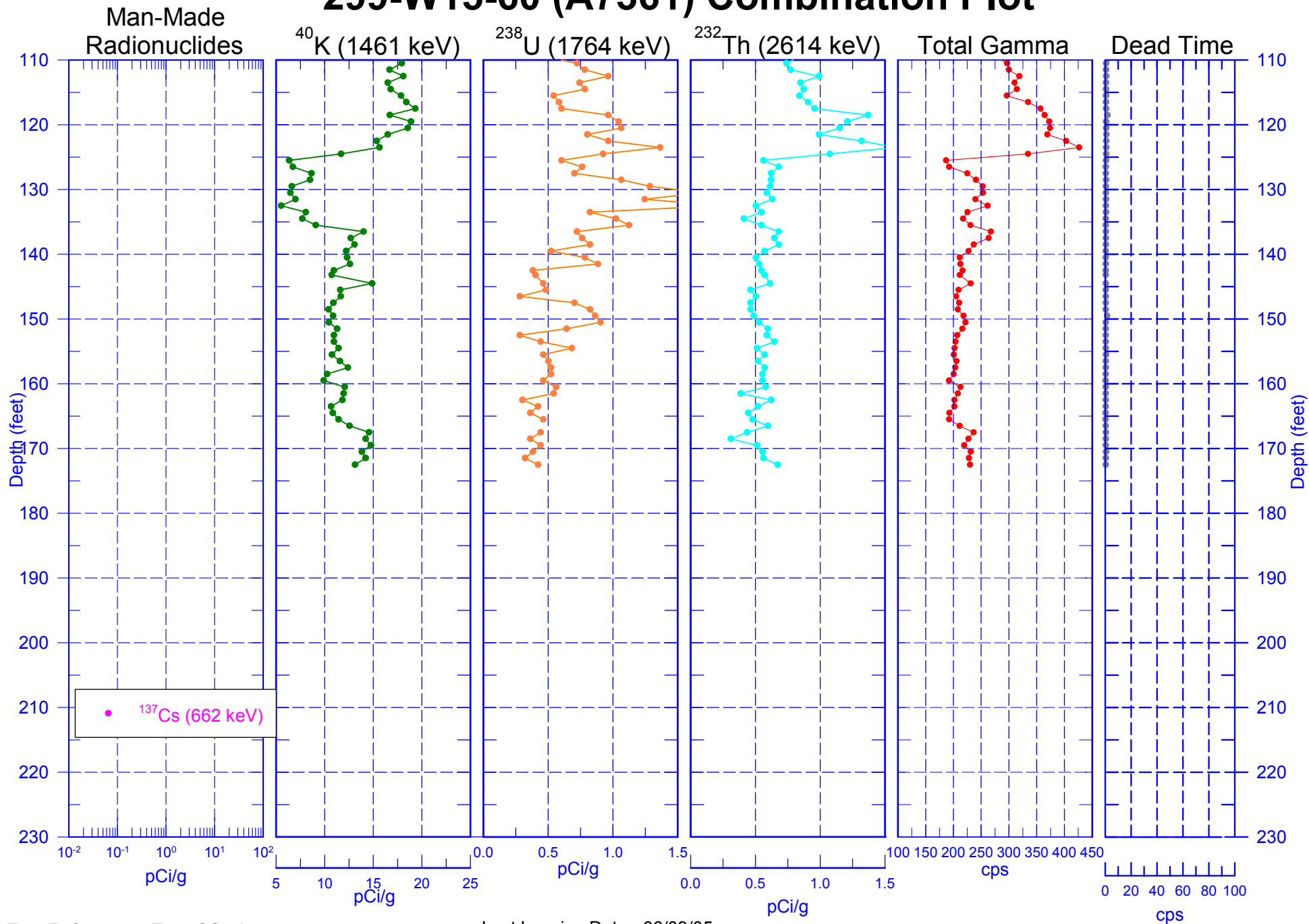
Zero Reference = Top of Casing

Last Log Date - 06/08/05

# 299-W15-60 (A7361) Combination Plot



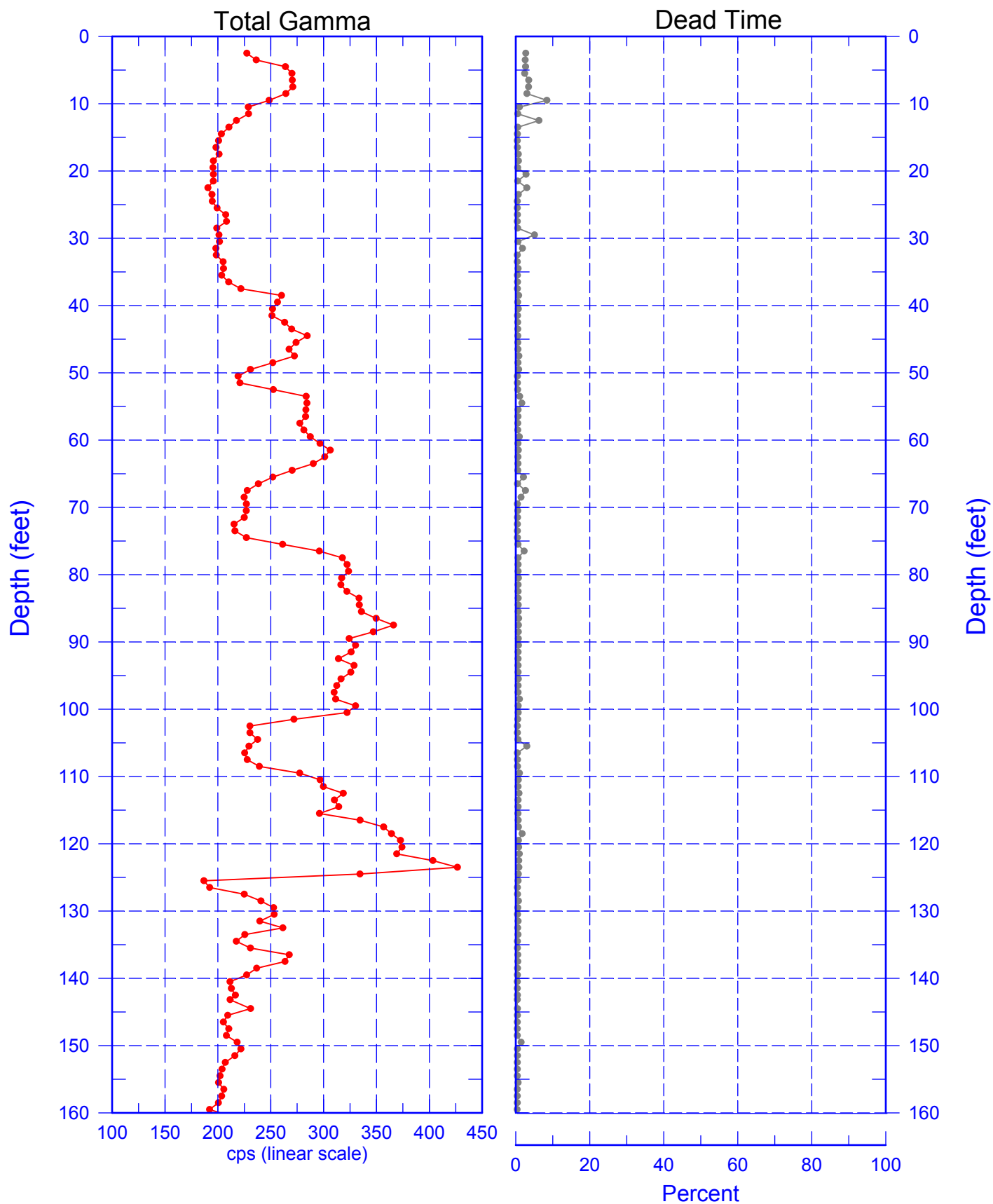
# 299-W15-60 (A7361) Combination Plot





# 299-W15-60 (A7361)

## Total Gamma & Dead Time

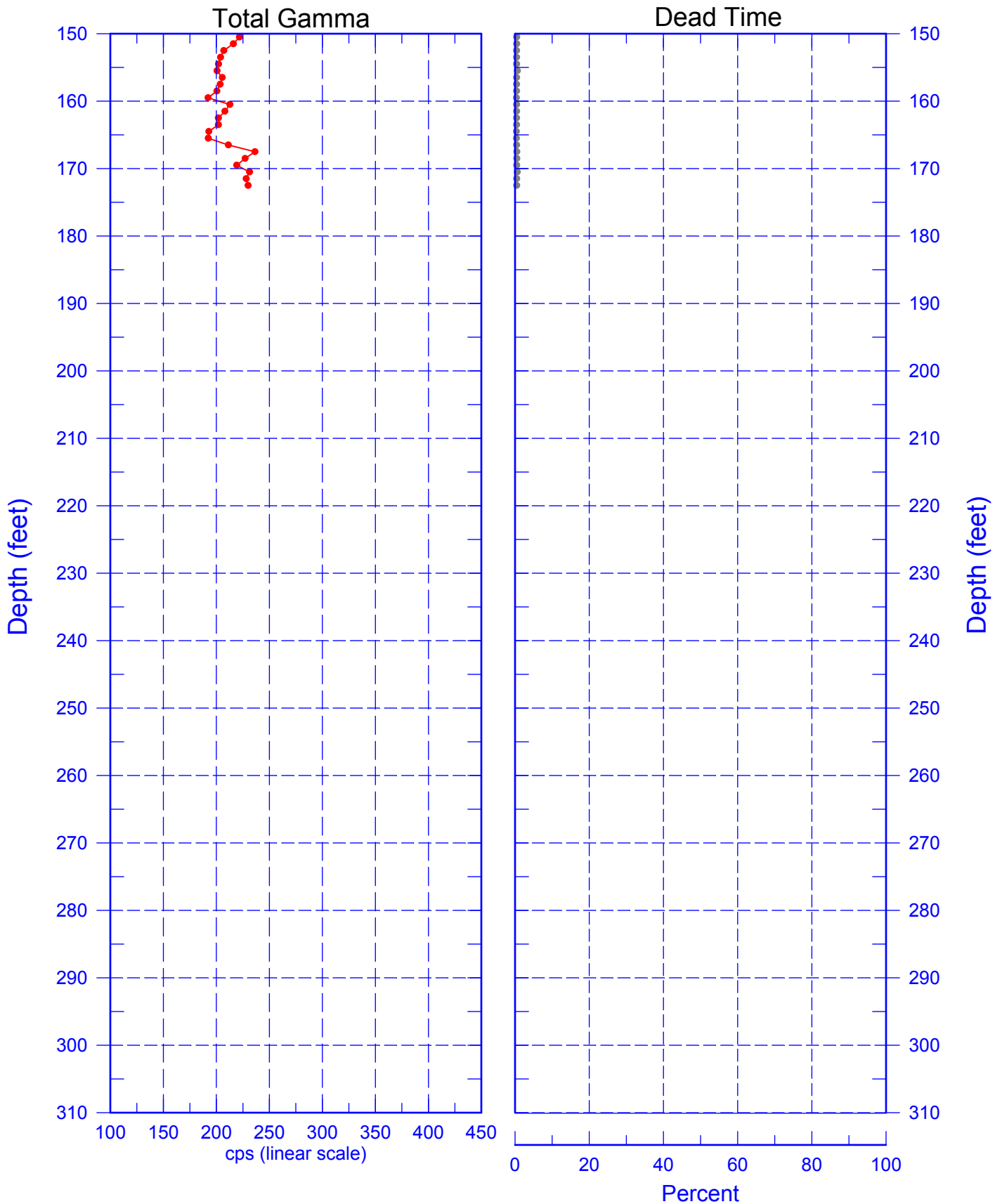


Zero Reference = Top of Casing

Last Logging Date - 06/09/05

# 299-W15-60 (A7361)

## Total Gamma & Dead Time

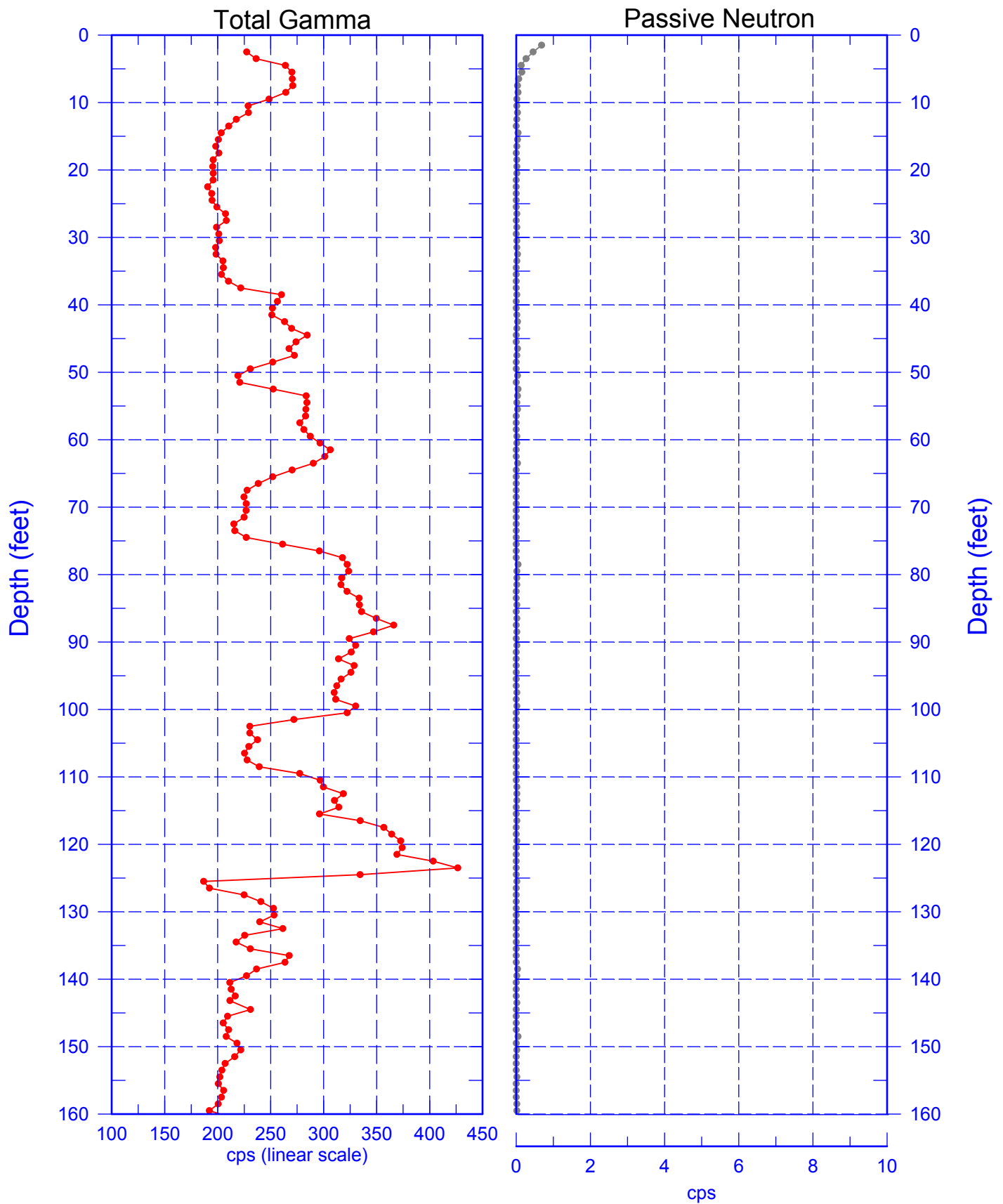


Zero Reference = Top of Casing

Last Logging Date - 06/09/05

# 299-W15-60 (A7361)

## Total Gamma & Passive Neutron

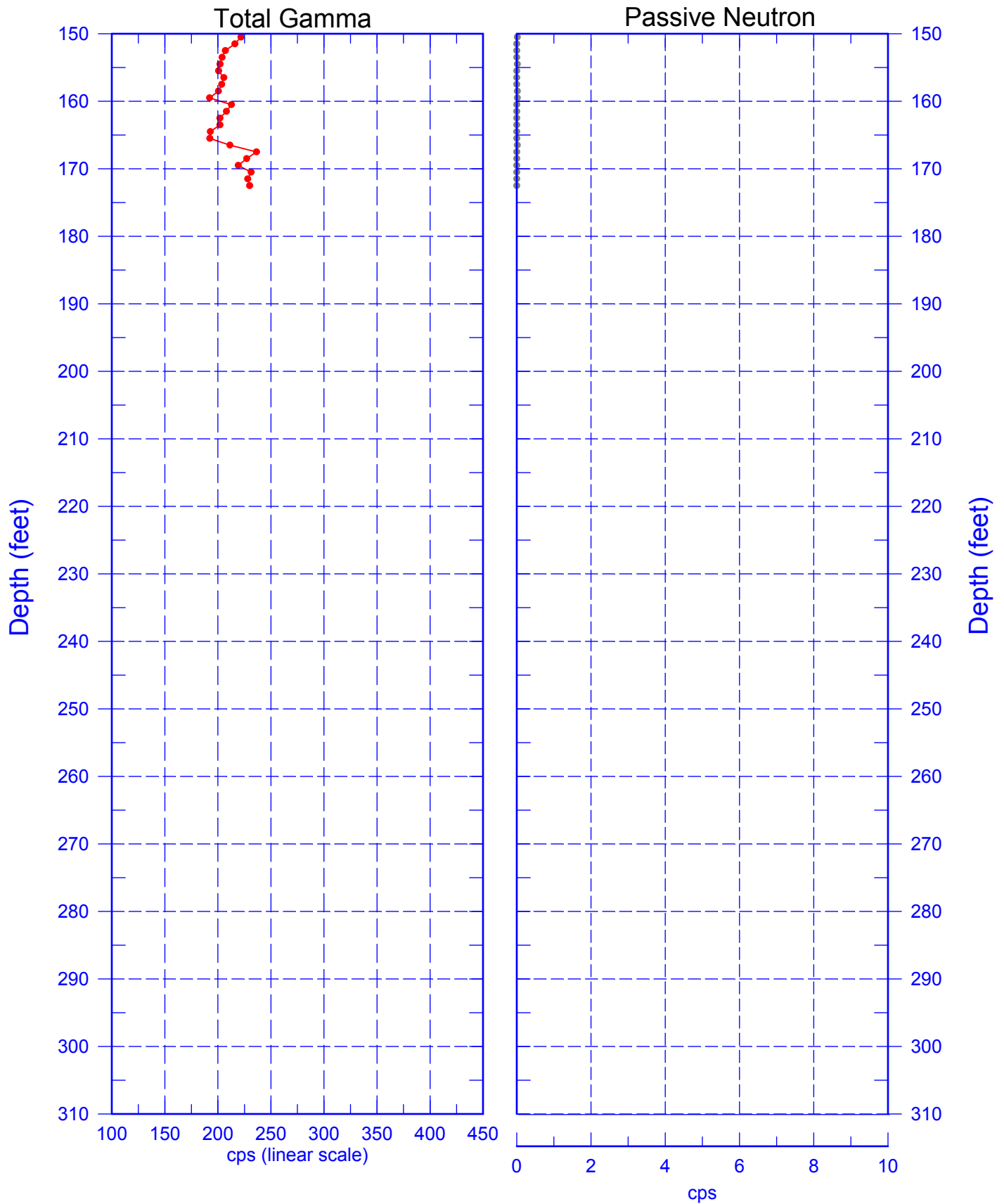


Zero Reference = Top of Casing

Last Logging Date - 06/09/05

# 299-W15-60 (A7361)

## Total Gamma & Passive Neutron

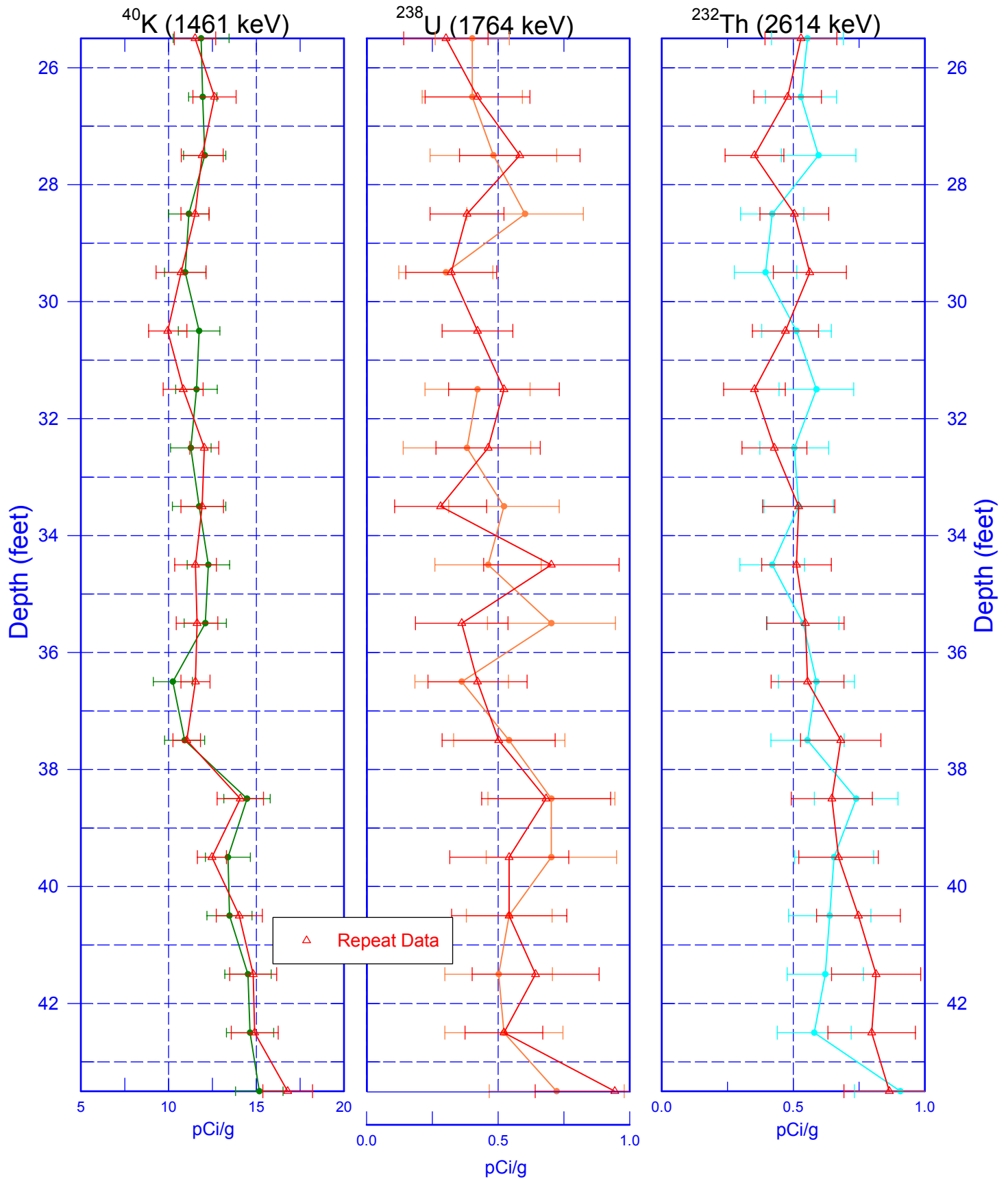


Zero Reference = Top of Casing

Last Logging Date - 06/09/05

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## Repeat Section of Natural Gamma Logs



Zero Reference = Top of Casing

Last Log Date - 06/09/05

# 299-W15-60 (A7361)

## Repeat Section for Passive Neutron

